532 Rec'd PCT/PTC 10 OCT 2000

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REV. 5-93

US DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEYS DOCKET NUMBER
P00,1774

U.S.APPLICATION NO. (if known, see 37 CFR 1.5)
09/673105

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE99/01007	**01April 1999**	**08 April 1998**

TITLE OF INVENTION

SUPPORT FOR ELECTRONIC COMPONENTS

APPLICANT(S) FOR DO/EO/US

ARMIN LABATZKE

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay.
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of International Application as filed (35 U.S.C. 371(c)(2)) - drawings attached.
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2) - drawings attached.
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98; **(PTO 1449, Prior Art, Search Report).**
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:
    a. ☒ Submission of Drawings -
    B. ☒ Express Mail Label EJ 077699306US

U.S.APPLICATION NO. (if known, see 37 C.F.R. 1.5) 09/673105	INTERNATIONAL APPLICATION NO. PCT/DE99/01007	529 Rec'd PCT/PTO 10 OCT 2000 ATTORNEY'S DOCKET NUMBER P00,1774

17. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5): Search Report has been prepared by the EPO or JPO $860.00		
International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) $690.00		
No international preliminary examination fee paid to USPTO (37 C.F.R. 1.482) but international search fee paid to USPTO (37 C.F.R. 1.445(a)(2) $760.00		
Neither international preliminary examination fee (37 C.F.R. 1.482) nor international search fee (37 C.F.R. 1.445(a)(2) paid to USPTO $1000.00		
International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) $100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860.00	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 C.F.R. 1.492(e)).	$	

Claims	Number Filed		Number Extra	Rate		
Total Claims	10	- 20 =		X $18.00	$ 00	
Independent Claims	01	- 3 =		X $ 80.00	$ 00	
Multiple Dependent Claims				$270.00 +		
				TOTAL OF ABOVE CALCULATIONS =	$860.00	
Reduction by ½ for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 C.F.R. 1.9, 1.27, 1.28)					$	
				SUBTOTAL =	$ 860.00	
Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +					$	
				TOTAL NATIONAL FEE =	$ 860.00	
Fee for recording the enclosed assignment (37 C.F.R. 1.21(h). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). $40.00 per property +						
				TOTAL FEES ENCLOSED =	$ 860.00	
				Amount to be refunded	$	
				charged	$	

a. ☒ A check in the amount of $860.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 501519. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Steven H. Noll
SIGNATURE

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BOX PCT

IN THE UNITED STATES DESIGNATED OFFICE

OF THE UNITED STATES PATENT AND TRADEMARK OFFICE

UNDER THE PATENT COOPERATION TREATY-CHAPTER II

AMENDMENT "A" PRIOR TO ACTION

APPLICANT:	Armin Labatzke
ATTORNEY DOCKET NO.	P00,1774
INTERNATIONAL APPLICATION NO:	PCT/DE99/01007
INTERNATIONAL FILING DATE:	April 1, 1999

INVENTION: "SUPPORT FOR ELECTRONIC COMPONENTS"

Assistant Commissioner for Patents

Washington, D.C. 20231

Sir:

Applicant herewith amends the above-referenced PCT application as follows, and request entry of the Amendment prior to examination in the United States National Examination Phase.

IN THE SPECIFICATION:

On page 1, above line 1, insert a centered heading

--TITLE--;

above line 2, insert:

--**BACKGROUND OF THE INVENTION**

Field of the Invention--;

in line 2, insert --present-- preceding "invention";

above line 4, insert a left margin-justified heading:

--**Description of the Prior Art**--;

in line 5, cancel "plastics" and substitute --plastic-- therefor;

in line 18, cancel "derive" and substitute --are obtained-- therefor;

in line 19, cancel "great" and substitute --large-- therefor;

in line 22, cancel "a lessening of the planarity occurs in", and after "pins" insert --becomes somewhat non-planar--.

On page 2, in line 3, cancel "a matter of";

in line 6, cancel "a matter of";

in line 16, cancel "traditionally" and substitute --conventionally-- therefor;

above line 21, insert a centered heading

--**SUMMARY OF THE INVENTION**--;

in line 21, cancel "offer" and substitute --provide-- therefor;

in line 24, cancel "2" and substitute --that are-- therefor;

in line 25, cancel "whereby" and substitute --with-- therefor, and cancel "are" and substitute --being-- therefor;

in line 26, cancel "this being characterized in that" and substitute --with-- therefor;

in line 27, cancel "3 are";

in line 28, cancel "2, whereby a" and substitute --, with the-- therefor;

in line 29, cancel "surface is" and substitute --surfaces being-- therefor, cancel "one of" and cancel "2" ;

in line 30, cancel "What are understood under the" and substitute --The-- therefor, and cancel "according to the"; and

in line 31, cancel "invention are" and substitute --means-- therefor.

On page 3, in line 6, cancel "2";

in line 13, cancel "3" (both occurrences);

in line 20, cancel "roof element 13" and substitute --base-- therefor;

in line 21, cancel "17", and cancel "roof element 11" and substitute --base-- therefor;

in line 22, cancel "However, it is just as possible that" and substitute --Alternatively,-- therefor, and cancel "is" and substitute --can be-- therefor;

in line 24, cancel "wall" and substitute --sidewall-- therefor;

in line 25, cancel "3" and cancel "2";

in line 27, cancel "3" and cancel "2";
in line 28, cancel "2";
in line 29, cancel "walls 12" and substitute --sidewalls-- therefor;
in line 30, cancel "2"; and
in line 31, cancel "roof element 13" and substitute --base-- therefor, and cancel "walls" and substitute --sidewalls-- therefor.

On page 4, in line 1, cancel "2", and cancel "5";
in line 2, cancel "roof element" and substitute --base-- therefor, and cancel "walls" and substitute --sidewalls-- therefor;
in line 3, after "cuboid" insert --that is-- therefor;
in line 5, cancel "4";
in line 7, cancel "2", and cancel "3";
in line 13, cancel "4";
in line 14, cancel "2", and cancel "4"
in line 16, cancel "4";
in line 17, cancel "15";
in line 18, cancel "7";
in line 20, cancel "3";
in line 21, cancel "Said" and substitute --This-- therefor, and cancel "7";
in line 22, cancel "15";
in line 24, cancel "7", and cancel "15";
in line 25, cancel "3";
in line 28, cancel "co-planarity of the plane-";
in line 29, cancel "parallel", and cancel "2"; and
in line 30, cancel "contributes less" and substitute --deviate from a precisely parallel relationship by no more-- therefor.

On page 5, in line 1, cancel "roof element 13" and substitute --base-- therefor;

in line 2, cancel "2";

in line 3, cancel "roof element 11" and substitute --base-- therefor, and cancel "6";

in line 5, cancel "a matter of" and cancel "10";

in line 6, cancel "9", cancel "14", and cancel "said" and substitute --the-- therefor;

in line 7, cancel "roof element 11" and substitute --base-- therefor;

in line 8, cancel "(17)";

in line 12, cancel "(2)"; and

in line 14, cancel "(3)".

On page 6, in line 10, cancel "17";

in line 11, cancel "according to claim 1" and substitute --having a structure in accordance with the invention as described above-- therefor;

in line 12, cancel "7", and cancel "the channel edges 15" and substitute --channels in the component edges-- therefor;

in line 13, cancel "7", and cancel "4";

in line 14, cancel "7", and cancel "3", and cancel "potentially" and substitute --if necessary-- therefor, and cancel "removal" and substitute --removing-- therefor;

in line 15, cancel "of", cancel "7", and cancel "8";

in line 20, insert --each-- preceding "having", and cancel "respectively having"; and

cancel lines 28-30 and substitute the following therefor:

--**DESCRIPTION OF THE DRAWINGS**

Figure 1 is a schematic illustration of an inventive carrier member.

On page 7, cancel lines 1-5 and substitute the following therefor:

--Figure 2 shows the carrier member of Figure 1 in a view from above, with the surfaces facing toward the motherboard material being located at the underside of the carrier member.

Figure 3 shows the inventive carrier member of Figure 1 from the side, with contacted and non-contacted wires also being shown.

Figure 4 is a perspective view of a further embodiment of an inventive carrier member.

DESCRIPTION OF THE PREFERRED EMBODIMENTS--;

in line 6, cancel "comprises";

in line 7, cancel "roof" and substitute --base-- therefor; and

in line 30, cancel "," after "or".

On page 8, in line 1, cancel "respectively,";

in line 4, after the period, insert the following sentence: --This embodiment has a base 13 with two co-planar sidewalls 12 disposed perpendicularly relative to the base 13.--, and cancel "worked in" and substitute --integrated-- therefor;

in line 5, after "surface" insert --11--, and after "side" insert --of the base 13--;

in line 13, cancel "thereof"; and

below line 23, insert the following paragraph:

--Although modifications and changes may be suggested by those skilled in the art, it is the intention of the inventor to embody within the patent warranted hereon all changes and modifications as reasonably and properly come within the scope of his contribution to the art.--.

IN THE CLAIMS:

On page 9, cancel "**Patent Claims**" and substitute

--**I CLAIM AS MY INVENTION:**-- therefor.

Please amend claim 1 as follows:

1. (Amended) [Carrier] A carrier member composed of a ceramic for electronic components having at least two metallic contact surfaces [(2)] electrically insulated from one another, said [whereby the] contact surfaces [are arranged] being disposed on a common plane of the carrier member, [characterized in that] further metallized surfaces [(3) are located] disposed on at least one surface of the carrier member that does not proceed parallel to the common plane of the contact surfaces [(2), whereby a] and respective conductive connections between said metallized surfaces and said [surface is conductively connected to one of the] contact surfaces.

Please amend claim 2 as follows:

2. (Amended) [Carrier] A carrier member according to claim 1, [characterized in that] wherein the carrier member comprises a base and [roof element (13), whereby] an inductive component [(17) is arranged] disposed on [the] an inside surface of the base [roof element (11)].

Please amend claim 3 as follows:

3. (Amended) [Carrier] A carrier member according to claim 1 [or 2, characterized in that] wherein the surfaces that do not proceed parallel to the common plane of the contact surfaces [(2)] and on which the metallized surfaces [(3)] are located, proceed at an angle of 90° relative to the common plane of the contact surfaces [(2)].

Please amend claim 4 as follows:

4. (Amended) [Carrier] A carrier member according to [at least one of the claims] claim 1 [through 3, characterized in that the carrier member comprises] comprising two walls [(12)] proceeding at an angle of 90° relative to the common plane of the contact surfaces [(2)], a [roof

element (13) that is arranged] base disposed perpendicular to the walls and parallel to the common plane of the contact surfaces [(2)], and two end walls [(5)] that are [arranged] perpendicular to the base [roof element] and the walls.

Please amend claim 5 as follows:

5. (Amended) [Carrier] A carrier member according to [at least one of the claims] claim 1 [through 4, characterized in that] channel-shaped depressions [(4) are] situated between the metallic contact surfaces [(2)] and the metallized surfaces [(3)], [whereby] the channel-shaped depressions [are] not being metallized.

Please amend claim 6 as follows:

6. (Amended) [Carrier] A carrier member according to claim 5, [characterized in that] wherein said channel-shaped depressions [(4)] are [arranged] disposed on the common plane of the contact surfaces [(2)] and comprising further channel-shaped depressions [(4) are located] disposed on the planes that do not proceed parallel to the common plane of the contact surfaces, [whereby these] said further channel-shaped depressions [(4)] arranged on various planes [form] forming channel edges [(15)].

Please amend claim 7 as follows:

7. (Amended) [Carrier] A carrier member according to [at least one of the claims 1 through] claim 6, comprising [characterized in that] a lead that [(7)] is electrically conductively connected to one of said [a] metallized surfaces [surface (3)].

Please amend claim 8 as follows:

8. (Amended) [Carrier] A carrier member according to [at least one of the claims 1 through] claim 7, [characterized in that the] wherein one of said channel edges [edge] guides [a] said lead [(7)] such that the lead is mechanically localized [experiences a mechanical localization] in the channel edges [(15)].

Please amend claim 9 as follows:

9. (Amended) [Carrier] A carrier member according to claim 8, [characterized in that] wherein the lead [(7)] guided by the channel edge [(15)] is conductively connected to one of said [a] metallized [surface (3)] surfaces immediately adjacent to [the] a corresponding channel-shaped depression.

Please amend claim 10 as follows:

10. (Amended) [Carrier] A carrier member according to [at least one of the claims] claim 1 [through 9, characterized in that the co-planarity of the plane-parallel] contact surfaces [(2) amounts to] have a co-planarity of less than 100 µm, whereby the co-planarity is [the] a maximum spacing from a plane that lies parallel to the contact surfaces [(2)] and that has been calculated from the individual heights of the contact surfaces [(2)].

Please amend claim 11 as follows:

11. (Amended) [Carrier] A carrier member according to [at least one of the claims] claim 1 [through 10, characterized in that a roof element (13)] comprising a base proceeding parallel to the common plane of the contact surfaces [(2) is present], and a conical frustum [(10) is arranged] disposed on [the] an inside surface of the base and projecting toward an [roof element (11) in the direction of the] interior of said carrier member [(6)].

Please amend claim 12 as follows:

12. (Amended) [Carrier] A carrier member according to [at least one of the claims] claim 1 [through 11, characterized in that a roof element (13)] comprising a base proceeding parallel to the common plane of the contact surfaces [(2) is present], and a core [(9)] with a winding [(14) is arranged] disposed on [the] an inside surface of the [roof element (11) in the] base in a direction [of the] toward an interior of said carrier member.

Please cancel claims 13, 14 and 15.

Please add the following new claim 16:

16. A method for manufacturing an electronic component, comprising the steps of:

providing a carrier member composed of ceramic having at least two metallic contact surfaces that are electrically insulated from one another, said contact surfaces being disposed on a common plane of the carrier member, and said carrier member having further metallized surfaces disposed on at least one surface of said carrier member that does not proceed parallel to said common plane of said contact surfaces, and having respective conductive connections between said metallized surfaces and said contact surfaces, and said carrier member having an inside surface;

fastening an inductive component on said inside surface of said carrier member, said inductive component having wires proceeding therefrom;

producing channel edges between said metallic contact surfaces in said common plane of said carrier member;

guiding said wires of said inductive component over said channel edges;

guiding said wires at an angle relative to said channel edges; and contacting said wire to one of said metallized surfaces.

IN THE ABSTRACT:

Please add the Abstract attached hereto on separately numbered page 12.

REMARKS:

The present Amendment revises the specification and claims and adds an Abstract, in order to conform to the requirements of United States patent practice. No new matter is added thereby.

The amendments to the claims have been made solely top conform the claims to the requirements of 35 U.S.C. §112, second paragraph, and no change in any of the claims has been made for the purpose of distinguishing any claim over the teachings of the prior art. Accordingly, no change in the language of any claim is considered by the Applicant as a surrender of any subject matter encompassed within the scope of the original claims.

Respectfully submitted,

Steven H. Noll (Reg. No. 28,982)

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ABSTRACT OF THE DISCLOSURE

A ceramic carrier member for an electronic component has at least two metallic contact surfaces which are electrically insulated from each other, and which are disposed on a common plane of the carrier member. Further metallized surfaces are positioned on at least one plane of the carrier member which is not parallel to the common plane of the contact surfaces. The metallized surfaces are respectively electrically conductively connected to the contact surfaces. In a method for making an electronic component, an inductive component is disposed on an inside surface of this carrier, and wires proceeding from the inductive component are conducted through channels between the contact surfaces and are electrically connected to one of the metallized surfaces.

CARRIER MEMBER FOR ELECTRONIC COMPONENTS

The invention is directed to a carrier member of ceramic for electronic components.

Carrier members for electronic components such as, for example, inductances, are often composed of plastics. The advantages of plastic as material for the carrier member are low costs, easy workability and low weight. Thus, for example, inductive components for ISDN applications are produced in commercially standard formats in pin embodiment, SMD embodiment or in formats suitable for PCMCIA cards. Corresponding structures are known, for example, from the company publication, "ISDN-Bauelemente", of Vacuumschmelze GmbH, Hanau, 1996. Such carrier members comprise electrical terminals that, for example, can be connected to the interconnects of a motherboard by soldering.

During the course of continued technological development, it is mainly housing formats in SMD technique, which are surface-mountable, that are being recently utilized. For mounting the components on a motherboard surface, it is desirable that the surfaces or, respectively, electrical terminals of the component that come into contact with the motherboard lie as flat as possible on the planar motherboard surface. Advantages derive in SMD mounting technology when the planarity of the surfaces is as great as possible. With respect to the planarity, however, the aforementioned carrier members of plastic have disadvantages. When the metallic terminal pins are connected to the leads of an electronic component, for example by soldering, a lessening of the planarity occurs in the region of the pins due to the heating during soldering. Further, a swelling of the housing due to heating of the entire housing also occasionally occurs during the subsequent soldering onto the motherboard.

A further disadvantage is the comparatively high requirement for solder agent during the equipping of the motherboard.

Carrier members of ceramic are known from the informational publication, "Keramische Werkstoffe für die Electronik", Informationszentrum Technische Keramik, Selb, 1996. The described ceramic materials of aluminum

oxide or aluminum nitride are utilized as substrates for electronic circuits and as housing for semiconductor circuits or thyristors and diodes. The described housings are a matter of dual in-line housings (DIL) or chip carriers for surface mounting according to the SMD technique.

Ceramic carrier members for electrical coils are known from a company brochure of CeramTec, Marktredwiz, 1996. These carrier members are a matter of bridge-forming elements that surround the inductive component. The leads of the inductive component such as, for example, the leads of a coil located in the inside of the carrier member can only be joined to the metallized surfaces of the bridge-forming carrier at that plane of the carrier member facing toward the motherboard material. To this end, surface elements that are metal-coated sector-by-sector are located on this plande [sic]. The connection of the leads to the metal-coated surfaces thus ensues in the regions of the solder points.

The demands made of a carrier member for electronic components given SMD technique can be only inadequately met with the above-described embodiments. The traditionally designed carrier members are not always up to the demands, particularly in view of the planarity of the metallic surfaces of the ceramic carrier member facing toward the motherboard material. An optimally low fluctuation in the planarity of the components in the region of the metallic surfaces is therefore advantageous for utilizing the advantages of SMD mounting technology.

An object of the present invention is to offer a carrier member that does not exhibit the aforementioned disadvantages of known carrier members.

The inventive object is achieved by a carrier member composed of a ceramic for electronic components having at least two contact surfaces 2 electrically insulated from one another, whereby the contact surfaces are arranged on a common plane of the carrier member, this being characterized in that further metallized surfaces 3 are located on at least one surface of the carrier member that does not proceed parallel to the common plane of the contact surfaces 2, whereby a respective metallized surface is conductively connected to one of the contact surfaces 2.

What are understood under the term "contact surfaces" according to the invention are metallized surface layers that are located on the surface of the carrier

member and that are provided for joining the carrier member to the motherboard material. The contact surfaces are therefore arranged plane-parallel to one another. The shape of the contact surfaces is arbitrary. Dependent on the desired demand, for example, they can be square, rectangular, round or also n-polygonal. Different shapes of contact surfaces on one carrier member are also conceivable.

The width of the contact surfaces 2 preferably lies in the range from 0.1 through 5 mm. A range from 0.5 through 10 mm is preferred for the length of the contact surfaces.

The common plane on which the contact surfaces are located usually corresponds to the underside of the carrier member, i.e. the side facing toward the motherboard material.

The metallized layers located on the carrier member in the region of the contact surfaces 3 of the metallized surfaces 3 are essentially composed of a conductive material such as, for example, Cu, Ni, Au, C, W, Pt, Ag etc. It is possible that the manufacture of this coating ensues such that one or more intermediate layers are first applied and the conductive, metallized layer is applied as last layer. Suitable methods for coating ceramic materials with conductive layers are notoriously known. The thickness of the metallized layer preferably lies in a range from 0.1 through 40 µm.

The carrier member preferably comprises a roof element 13 having an inductive component 17 arranged on the inside surface of the roof element 11. However, it is just as possible that the component is secured to some other surface of the carrier member, for example to a wall.

The geometrical shape of the inventive carrier member must be selected such that the metallized surfaces 3 do not lie in the region of the contact surfaces 2. The surfaces that do not proceed parallel to the common plane of the contact surfaces 2 and on which the metallized surfaces 3 are located therefore preferably proceed at an angle of 90° relative to the common plane of the contact surfaces 2.

The inventive carrier member preferably comprises two walls 12 proceeding at an angle of 90° relative to the common plane of the contact surfaces 2, a roof element 13 that is arranged perpendicular to the walls and parallel to the

common plane of the contact surfaces 2, and two end faces 5 that are arranged perpendicular to the roof element and to the walls. An example of a geometrical shape of this type is a cuboid open at one side having rectangular surfaces that has the shape of a shoe box.

Channel-shaped depressions 4 that, for example, can be introduced into the ceramic material by grinding, sawing or milling are preferably located between the metallized contact surfaces 2 and the metallized surfaces 3. These channel-like depressions are not metallized. It is also possible that the formed member already comprises corresponding, channel-shaped depressions in the manufacture, for example following a standard ceramic manufacturing method after the burning. The spacing of the channel-shaped depressions preferably lies in a range between 0.2 and 5 mm.

Channel-shaped depressions 4 are preferably arranged on the common plane of the contact surfaces 2 and further channel-shaped depressions 4 are arranged on the surfaces that do not proceed parallel to the common plane of the contact surfaces. These channel-shaped depressions 4 arranged on different planes form channel edges 15 in the region of the edges.

When a lead 7 of, for example, a coil is to be connected to the inventive carrier member, then this lead 7 is preferably electrically conductively connected to a metallized surface 3.

Said lead is expediently conducted such through the channel edge 7 that the wire experiences a mechanical localization in the channel edges 15. This measure relieves a potentially existing contact and protects the wire against slipping.

The lead 7 guided by the channel edge 15 is preferably conductively connected to a metallized surface 3 immediately adjacent to the corresponding, channel-shaped depression.

The contact surfaces of the inventive carrier member are very precisely manufactured and therefore exhibit high planarity. The co-planarity of the plane-parallel contact surfaces 2, defined according to the method described above, preferably contributes less than 30 μm.

When the carrier member comprises a roof element 13 proceeding parallel to the common plane of the contact surfaces 2, then a fastening means can be present at the inside surface of the roof element 11 in the direction of the interior 6. The fastening means can, for example, serve for fastening a coil. The fastening means is preferably a matter of a conical frustum 10.

A core 9 with a winding 14 is preferably arranged at said inside surface of the roof element 11.

The inductive component (17) is also expediently secured to the inside surface of the upper side, for example with a standard adhesive. It is especially preferred when the interior is cast out with the adhesive.

No leads for electrical components are preferably attached or contacted at the contact surfaces (2) arranged at the underside of the carrier member. When a lead is joined to the carrier member according to the invention, the connection to the conductive surfaces ensues via the metallized surfaces (3) located, for example, at the side of the component.

The definition of the co-planarity ensues according to a laser distance measuring method. According to this method, the heights of the metallized surfaces facing toward the motherboard material are defined in a direction perpendicular to the common plane of the contact surfaces (Z-direction). One thereby proceeds such that the measured values of the height in Z-direction are determined in defined spacings from the leading edge of the carrier member. A compensation plane according to Gauss is calculated from these Z-measured values. The co-planarity is the sum of the amounts of the maximum and the minimum deviation of these values from the calculated, average compensation plane.

The inventive carrier members preferably comprise a co-planarity of less than 100 μm, particularly less than 50 μm. It is quite particularly preferred when the co-planarity lies below 30 μm.

The present invention is also directed to an electronic component that contains an inventive carrier member. This component is characterized in that an electronic component such as, for example, a wound core is present in the carrier member.

The invention is also directed to the employment of the inventive carrier member for inductive components such as, for example, interface repeaters, interface modules, current-compensated inductors, power transformers, drive transformers for transistors, storage and filter inductors, transductor chokes, current transformers, current sensors, voltage transformers, drive repeaters for GTO/IGBT/SIPMOS, trigger transmitters and modules for thyristors or filter and smoothing inductors.

The inventive inductive component can be manufactured according to the following method that is likewise a subject matter of the present invention. The inventive method comprises the steps:

- fastening an inductive component 17 to the inside surface of a carrier member according to claim 1;
- guiding the wires 7 of the inductive component via the channel edges 15;
- guiding the wires 7 at an angle over the contact surface 4;
- contacting the wire 7 to the metallized surface 3 and, potentially, removal of the wire ends 7 projecting beyond the contact surfaces 8.

Example

Measurement of the co-planarity at 50 carrier members according to the invention.

The co-planarity was defined according to the above-described method at 50 carrier members having respectively having eight metallized surfaces according to the invention. All carrier members exhibited a co-planarity of less than 14 µm. Additionally, a data set was formed from the individual measured values of the spacings of the individual contact surfaces from the averaged compensation plane (Z-measured values). The plurality of measured values amounted to 8 x 50 = 400. The frequency distribution of these measured individual spacings from the compensation planes corresponded to a Gaussian distribution. The standard deviation of the Gaussian distribution amounted to 4.28 µm.

The present invention is now explained in greater detail on the basis of Figures 1 through 3.

Figure 1 shows an inventive carrier member in a schematic illustration.

Figure 2 shows the carrier member of Figure 1 in a view from above. The surfaces facing toward the motherboard material are located at the underside.

Figure 3 shows the inventive carrier member of Figure 1 from the side. Additionally, contacted and non-contacted wires are entered together with the carrier member.

The ceramic carrier 1 in Figure 1 is fashioned cuboid and comprises four lateral surfaces and one surface forming a roof. The ceramic material can, for example, be aluminum oxide or aluminum nitride. Surfaces 2 arranged raster-like are located on the plane facing toward the motherboard material. The surfaces 2 are metallically coated. Channels 4 that represent depressions that, for example, can be introduced into the wall by milling or grinding are located between the surfaces 2 arranged segment-by-segment. The channels 4 continue upwardly beyond the lateral walls. Metallized surfaces 3 are located between the channels situated on the lateral wall. The metallized surfaces 3 are electrically conductively connected to the contact surfaces 2. The metallic layers can be applied onto the ceramic carrier member in the way standard in the prior art. The plan view in Figure 2 shows the channels 4 and the lateral, metallized surfaces 3. A lacquered copper wire 7 that is connected to the inductive component part (not shown) is shown within the channels 4.

The side view of the inventive carrier member in Figure 3 shows how the lacquered copper wires proceed via the channel edge 15. The wire 7 is drawn around the channel edge 15 and proceeds at an angle 16 of more than 0° and less than 90° relative to the longitudinal axis of the metallized surfaces, proceeding over the metallized surfaces. The ceramic carrier 1 enables a machine contacting of the wires 7 to the contact surfaces 2 in an especially simple way. In this method, the wires 7 that can be connected to an inductance are first conducted over the channel edges 15 and are guided parallel to the lateral surface of the ceramic carrier at said angle 16. Subsequently, the wire is conductively connected to the metallized surface in the region of the metallized surface 3. The projecting wire ends are either removed or are automatically cut off upon contacting. As a result thereof, it is possible to reduce the mechanical stressing of the contacts 8. The guidance of the wire in channels 4 or,

respectively, over channel edges 15 contributes to a mechanical fixing of the wire 7. The contacting can, for example, ensue by welding.

Figure 4 shows a further embodiment of an inventive carrier member without end walls 5. A worked-in cone that is composed of the same material as the carrier is located at the inside surface of the upper side of the carrier member. An annular magnetic core 9 is plugged onto the cone 10, this being potentially secured, for example, with a standard adhesive compound. The connections of the lining 14 to the leads 7 are conducted via the channel edges 15 and end at the contacts 8.

Compared to carrier members of plastic, ceramic carrier members have the advantage of a far higher temperature resistance and a reduced sensitivity to moisture.

The local-planarality of the inventive carrier member - given mounting on a motherboard - provides the electronic component part with an improved wettability of the metallized terminal surfaces. As a result thereof, the layer thickness of the solder material that is utilized can be reduced and the processibility of, in particular, components having a small grid dimension, such as preferably less than approximately 0.2 mm, especially preferably less than 0.13 mm, can be significantly facilitated.

Another advantage of the inventive carrier member over known carrier members is that the guidance of the leads of a component in the channel edges (15) effects a mechanical fastening of the wire that proceeds beyond the standard fastening at the contact location. As a result of this measure, a nearly complete mechanical relieving of the electrical contact can be achieved accompanied by a far, far lower frequency of damage in the region of the contact.

Patent Claims

1. Carrier member composed of a ceramic for electronic components having at least two contact surfaces (2) electrically insulated from one another, whereby the contact surfaces are arranged on a common plane of the carrier member, characterized in that further metallized surfaces (3) are located on at least one surface of the carrier member that does not proceed parallel to the common plane of the contact surfaces (2), whereby a respective metallized surface is conductively connected to one of the contact surfaces.

2. Carrier member according to claim 1, characterized in that the carrier member comprises a roof element (13), whereby an inductive component (17) is arranged on the inside surface of the roof element (11).

3. Carrier member according to claim 1 or 2, characterized in that the surfaces that do not proceed parallel to the common plane of the contact surfaces (2) and on which the metallized surfaces (3) are located proceed at an angle of 90° relative to the common plane of the contact surfaces (2).

4. Carrier member according to at least one of the claims 1 through 3, characterized in that the carrier member comprises two walls (12) proceeding at an angle of 90° relative to the common plane of the contact surfaces (2), a roof element (13) that is arranged perpendicular to the walls and parallel to the common plane of the contact surfaces (2), and two end walls (5) that are arranged perpendicular to the roof element and the walls.

5. Carrier member according to at least one of the claims 1 through 4, characterized in that channel-shaped depressions (4) are situated between the metallic contact surfaces (2) and the metallized surfaces (3), whereby the channel-shaped depressions are not metallized.

6. Carrier member according to claim 5, characterized in that channel-shaped depressions (4) are arranged on the common plane of the contact surfaces (2) and further channel-shaped depressions (4) are located on the planes that do not proceed parallel to the common plane of the contact surfaces, whereby these depressions (4) arranged on various planes form channel edges (15).

7. Carrier member according to at least one of the claims 1 through 6, characterized in that a lead (7) is electrically conductively connected to a metallized surface (3).

8. Carrier member according to at least one of the claims 1 through 7, characterized in that the channel edge guides a lead (7) such that the lead experiences a mechanical localization in the channel edges (15).

9. Carrier member according to claim 8, characterized in that the lead (7) guided by the channel edge (15) is conductively connected to a metallized surface (3) immediately adjacent to the corresponding channel-shaped depression.

10. Carrier member according to at least one of the claims 1 through 9, characterized in that the co-planarity of the plane-parallel contact surfaces (2) amounts to less than 100 µm, whereby the co-planarity is the maximum spacing from a plane that lies parallel to the contact surfaces (2) and that has been calculated from the individual heights of the contact surfaces (2).

11. Carrier member according to at least one of the claims 1 through 10, characterized in that a roof element (13) proceeding parallel to the common plane of the contact surfaces (2) is present, and a conical frustum (10) is arranged on the inside surface of the roof element (11) in the direction of the interior (6).

12. Carrier member according to at least one of the claims 1 through 11, characterized in that a roof element (13) proceeding parallel to the common plane of the contact surfaces (2) is present, and a core (9) with a winding (14) is arranged on the inside surface of the roof element (11) in the direction of the interior.

13. Electronic component, characterized in that it contains a carrier member according to claim 1.

14. Employment of the carrier element according to claim 1 for inductive components.

15. Method for manufacturing an inductive element, comprising the steps:

-- fastening an inductive component (17) on the inside surface of a carrier member according to claim 1;

-- guiding the wires (7) of the inductive component over the channel edges (15);

-- guiding the wires (7) at an angle over the contact surface (4);

-- contacting the wire (7) to the metallized surface and potentially removing the wire ends projecting beyond the contact surfaces (8).

FIG 1

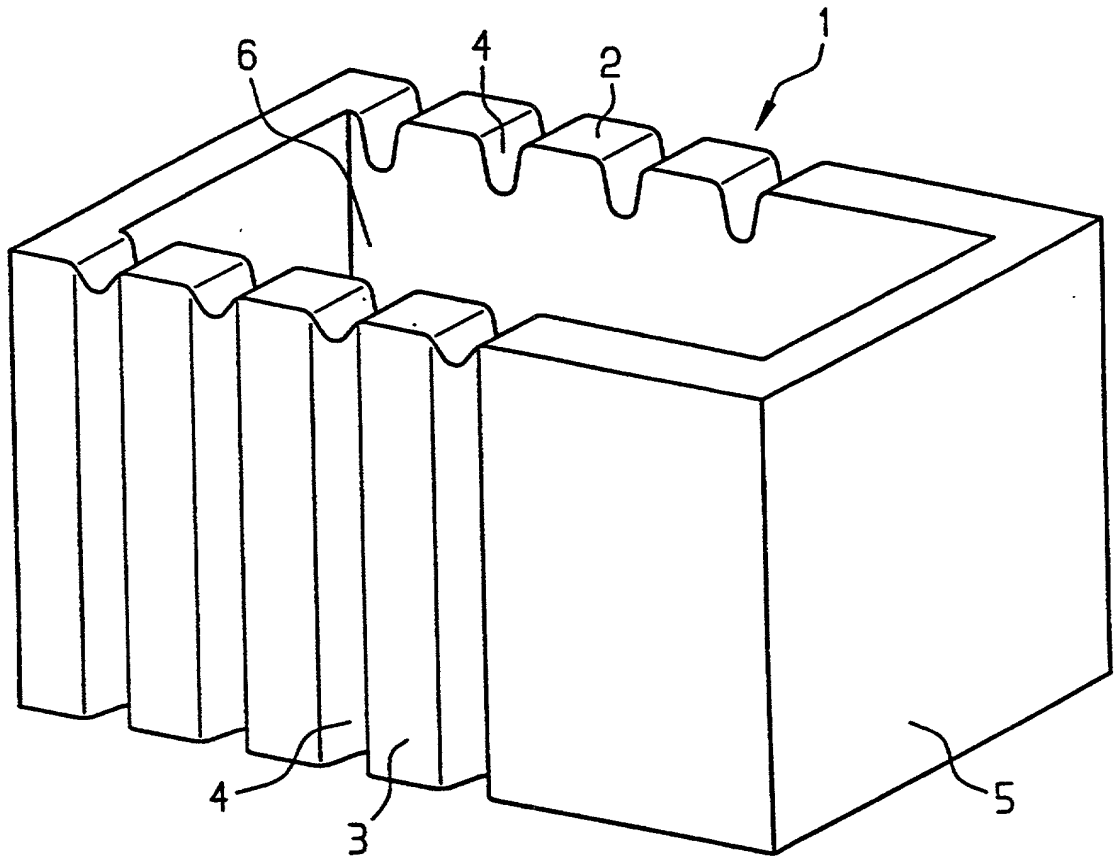


FIG 2

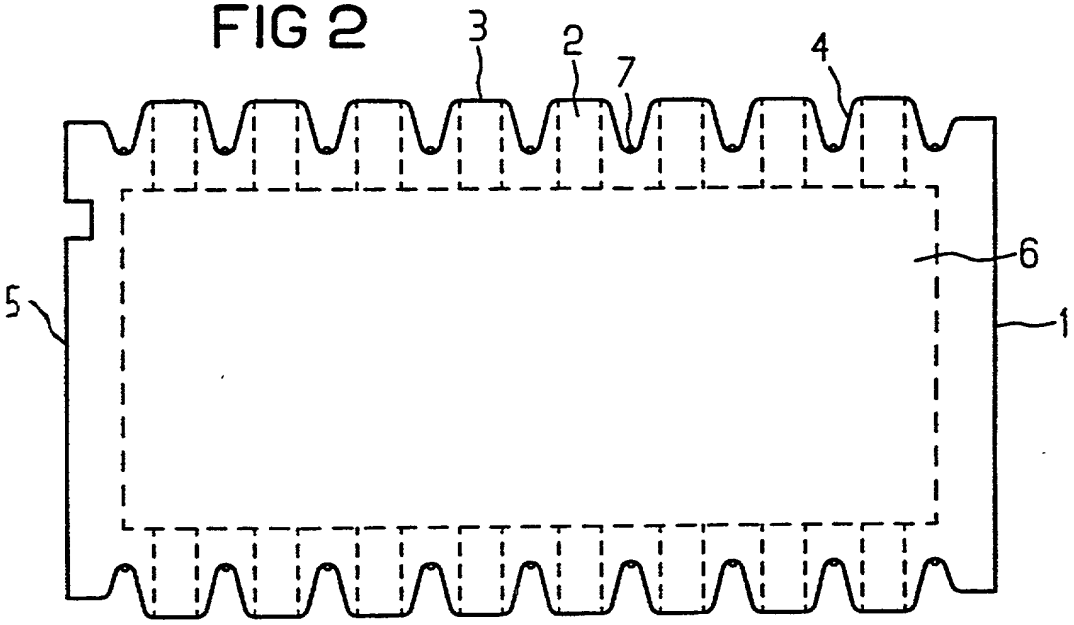


FIG 3

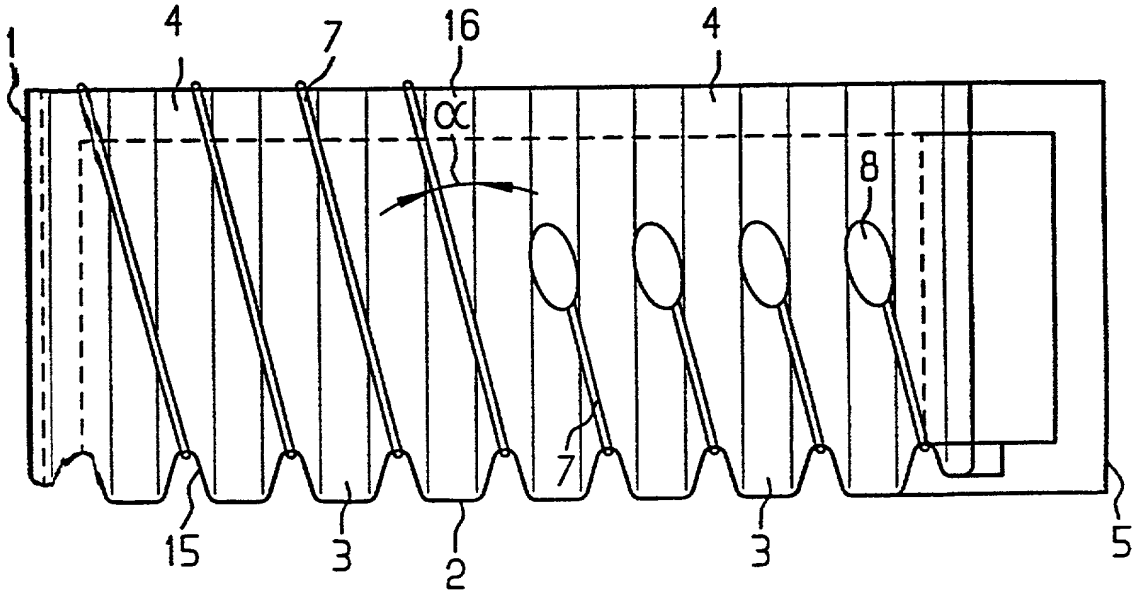
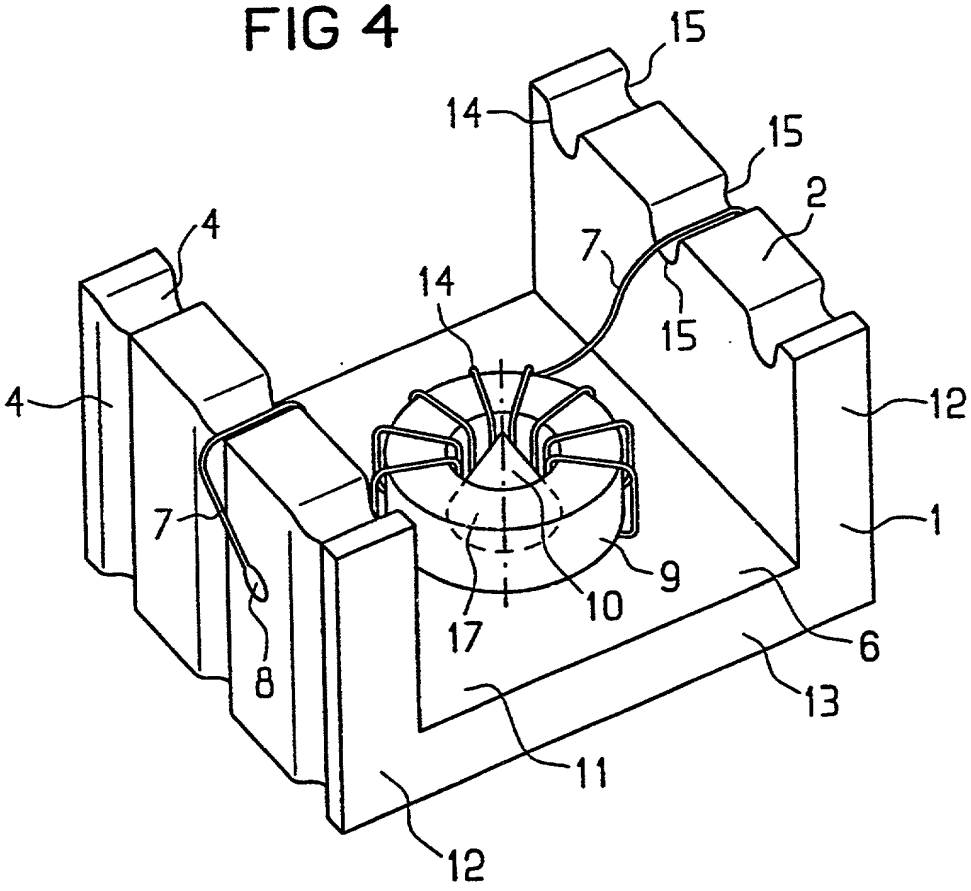


FIG 4



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German Language Declaration

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Trägerkörper für elektronische Bauelemente

_____

_____

_____

deren Beschreibung

(zutreffendes ankreuzen)

☒ hier beigefügt ist.

☐ am _____ als PCT internationale Anmeldung PCT Anmeldungsnummer _____ eingereicht wurde und am _____ abgeändert wurde (falls tatsächlich abgeändert).

the specification of which

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☐ is attached hereto.

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Prior foreign appplications
Priorität beansprucht

			Priority Claimed	
198 15 852.1	Germany	08. April 1998	☒	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein
			☐	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein
			☐	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein

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(Application Serial No.) (Anmeldeseriennummer)	(Filing Date) (Anmeldedatum)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending, abandoned)
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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

And I hereby appoint

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(Supply similar information and signature for third and subsequent joint inventors).